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A REPORT ON THE INTERNATIONAL FISHERIES ENERGY OPTIMIZATION WORKSHOP

August 28-30, 1989
University of British Columbia, Vancouver, B.C.

Convened By
Department of Fisheries and Oceans
Atlantic Fisheries Development Program

Supported By
The Federal Panel on Energy R&D (PERD)

Sponsored By
Food and Agriculture Organization of the United Nations
and International Energy Agency

Pêches et Océans Fisheries and Oceans

Canada

90-04864/

Minister of Supply and
Services Canada 1989

DSS Catalogue Number FS 68-2/1-IOE
ISBN 0-662-17376-7
ISSN 0835-7005

Published By:

Department of Fisheries and Oceans
Atlantic Fisheries Development Program
200 Kent Street
Ottawa, Ontario, Canada
K1A 0E6

Scientific Authority / Project Manager
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General Education Series #10

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The DPA Group Inc.
1989

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EXECUTIVE SUMMARY

The International Fisheries Energy Optimisation Working Group had its first meeting in Vancouver, Canada on 28th-30th August, 1989. The session was convened by the Canadian Department of Fisheries and Oceans under the Energy, Research and Development Program of the Canadian Government. The objectives of the meeting were:

1. To share up-to-date information about opportunities for optimising energy use in the fishing industry.

2. To consider how existing harvesting techniques, vessel designs, resource management methods, energy policies, and operational practices could best optimise use of energy. Also, what possibilities in these areas might exist in the future.

3. To identify opportunities for cooperative work between individuals and institutions in different countries. This would both reduce duplication of effort and realise synergistic benefits towards the goal of energy optimisation.

4. To provide guidelines on energy optimisation which will be specifically useful for delegates from different countries with different types of fishing industries (i.e. industrial/offshore, inshore, artisinal fisheries).

5. To decide on the future of the IFEO Working Group itself.

Delegates met in plenary sessions and then divided into smaller working sessions. Technical papers had been distributed well in advance of the meeting and were presented in summary form to plenary sessions by rapporteurs. The smaller working sessions examined the relevance of the concepts described in the papers and considered ways of realising energy optimising opportunities through these and other means in different types of fisheries.

The main conclusions from the Working Group's meeting were as follows:

1. Energy optimisation must be recognised, and should be better "promoted", to fishermen and to authorities who should encourage it as something which involves more than cutting down on the use of fuel. The concept involves the most effective use of energy in improving the overall economic return from the fisheries, and ideally should consider global sustainable development. Technical solutions to energy problems may sometimes be detrimental in the overall picture of resource and environmental management, unless they are put into practice together with means to ensure achievement of wider goals as well.

2. There is need for better cooperation and coordination internationally, particularly in technical efforts aimed at improved hull machinery and gear design, and transfer of appropriate technology to developing countries.

3. Whereas many of the participants in the Working Group meeting were primarily technicians, future meetings should involve policy making and resource management expertise as well.

4. The IFEO Working Group should continue in operation with the aims of:

   (a) Sponsoring and stimulating collection and exchange of information about energy optimisation.

   (b) Reviewing and monitoring technical research and development in this area.

   (c) Proposing ways and means of promoting improvements in current designs and practices to achieve energy optimisation.

   (d) Promoting training and education about energy optimisation.

   (e) Encouraging participation from interested individuals and institutions from different countries apart from those presently involved with the Working Group.

5. To achieve these general aims, the Working Group should take some concrete steps. Suggestions included:

   (a) Publication and appropriate translation of simple manuals, aimed at fishermen, showing how energy use could be reduced or optimised.

   (b) Distribution of a periodic newsletter outlining technical developments in energy optimisation, sources of information and opportunities for collaboration.

   (c) Assembly of a database of relevant literature.

6. All activities require the Working Group to have a more solid institutional base in the long term. Delegates accepted a proposal from the representative of the Food and Agriculture Organisation of the United Nations (FAO) that the next step towards policy formulation, for global acceptance, could be for FAO to convene an Expert Consultation the report of which would go to the FAO Committee on Fisheries; a report would also be submitted to the FAO Interdepartmental Working Group on Energy.

7. In the short term, before the FAO link could be properly established, the Working Group should continue to be organised by the Department of Fisheries and Oceans in Ottawa, Canada and have that as its temporary "institutional home".

8. The Working Group's future would be considered by a committee of seven experts, from Norway, India, USSR, USA, Netherlands, Canada, and FAO. They will meet in Cochin, India in February 1990 and review:

   (a) This report.

   (b) Other countries' and/or institutions' interest in joining the Working Group.

   (c) The procedure for linking with FAO.

   (d) Sources of future financial support for the Working Group itself.

   (e) When and where the next meeting of the Working Group should be (the USSR or Norway are likely candidate locations).

9. Despite fuel presently being relatively inexpensive, energy optimisation has a more and more important role to play in fisheries. This is so especially considering the pressure on fish stocks worldwide (leading to the use of even more energy per unit of fish caught in an already energy intensive industry), and concern about the global environmental effects of burning fossil fuels. The Working Group's efforts are timely and well justified.

1.0 INTRODUCTION

The International Fisheries Energy Optimisation Working Group was conceived at the World Fisheries Symposium in St. John's, Newfoundland in 1988. For many years, different countries and international organizations have been working directly and indirectly on how to use energy in the fishing industry more efficiently. As is made clear in this report, this may involve actual savings of energy or making best use of energy considering the overall economics of fishing operations. Hence the term "energy optimisation". The IFEO Working Group's mission is to attempt to bring some cohesion and efficiency to these efforts by:

(1) Sharing information about technological and other developments that have energy savings potential.

(2) Devising ways of disseminating that information between researchers and to those in the industry who can use it.

(3) Gaining institutional recognition for the need to tackle energy use problems in the fisheries and support for doing so over the long term.

The first meeting of the Working Group took place in Vancouver, Canada between 28th and 30th August 1989. Forty-seven delegates from 13 countries (including 29 from Canada) reviewed:

(1) Energy optimisation programs in different countries.

(2) Developments in harvesting technology with implications for energy optimisation.

(3) Developments in vessel design and construction which would assist energy optimisation.

(4) How to transfer energy saving technology to those who might profit by it, with particular reference to the needs of artisinal fisheries.

(5) More futuristic opportunities for energy optimisation.

(6) How the IFEO Working Group could work effectively carry out its mission in the future.

Several examples of items 1 to 5 were contained in papers distributed to delegates, and presented in summary form with discussion, at plenary meetings of the Working Group. Smaller group sessions then discussed these and other opportunities for energy saving and their applicability in particular types of fisheries.

There are many very easy ways to save fuel. Viewed simply from the point of view of saving fuel, many of the newer ideas and technologies might also be though to be obviously beneficial. Overall, however, energy optimisation in the fishing industry is a complicated problem. There are two reasons.

(1) Simple savings in fuel may not in fact be attractive from the point of view of the fishermen looking at his overall fishing operation. For example, money saved by returning slowly from a fishing trip may mean money lost from a lower price received for the catch.

(2) Energy efficiency, and the means to achieve it, is intimately connected with other aspects of the fishing industry. It *is* a problem in its own right. However, solutions to it are at least partly driven by other motives, most commonly the commercial motive of catching more fish more profitably.

Trends in fish resources and modern environmental thinking have added at least two important constraints, so that energy optimisation is now a matter which has a place in its own right. The first constraint is pressure on fish stocks, which means that energy efficiency is a more important consideration in the economics of fishing than it may have been, in that as fish become scarcer it takes more units of energy to catch a unit of fish. Secondly, despite a present relative abundance of energy, there is sudden awareness of the problems of excess burning of fossil fuels. This means energy efficiency is a matter to take seriously whether dictated by economic conditions or not.

The IFEO Working Group's task is to promote energy optimisation in as efficient ways as is possible. Owing to the complexity of the problem, "getting things done" is no easy matter. The next chapter details how, in principle, the Working Group thought this might be achieved. The three chapters following summarize specific opportunities for energy optimisation considering harvesting technology, vessel design, and technology transfer. The report concludes with a discussion of how the IFEO Working Group might best operate in the future and what needs to be done in the short and longer term to achieve that.

2.0 THE ENERGY OPTIMISATION PROBLEM, AND OUTLINES OF SOLUTIONS TO IT

2.1 Meaning of "Energy Optimisation"

What is "energy optimisation"? It does *not* necessarily mean the use of the least amount of energy in every situation. Rather, it means using energy in fishing to the greatest overall benefit of the individual fishing enterprise, national economy, and global environment. These three goals are not necessarily compatible, and policy makers may eventually need to set priorities. However, there is plenty of scope to move towards these goals without always having to make choices between them.

The concept of energy optimisation can also be expressed in terms of the modern environmental concept of sustainable development. The main objective of energy optimisation may be said to be:

> To ensure the use of fish stocks, capital, manpower, and energy, so that together these may yield the greatest sustainable benefit to the present generation while also maintaining the potential to meet the needs and aspirations of future generations.

Note that energy is but one component of a complex equation including fish stocks, capital, and manpower (at least). The challenge fishing industries and fisheries administrations face is to find ways of optimising the use of energy, at the same time as the other factors.

2.2 Plan for Achieving Energy Optimisation

Given the complexity of the problem, the Working Group sought to define some framework for a plan to work towards energy optimisation.

An outline scheme is listed below. It is necessary:

(a) To define the overall objective of energy optimisation (see above) and more concrete sub-objectives.

(b) To define the problems faced, both in saving energy as an objective by itself and in saving energy considering other constraints.

(c) To identify possible opportunities for solving the problems defined in (b).

(d) By an iterative process of considering those problems and possible opportunities for solving them, to identify strategies for achieving the defined objectives.

(e) To develop a practical plan of action: who should do what, where, and when.

(f) To act on that plan.

2.3 Sub-Objectives in Energy Optimisation

There are at least four areas where the concept of energy optimisation has to be considered: political, biological, technical and operational.

(a) As part of *energy policy*:

Those concerned with energy optimisation in fisheries must contribute to the development of national and international energy policy making. They must ensure this benefits the fishing industries of the world in the context of the need for global sustainable development.

(b) As part of *resource management*:

Those concerned with energy optimisation in fisheries must strive to ensure that fisheries regulations systems encourage efficiency and high productivity in general, and energy efficiency in particular.

(c) As part of *vessel and gear design* and *modification*:

There is a need to encourage development of energy efficient vessels and gear which are capable of adapting to changing conditions of fish stock and energy availability.

(d) As part of *vessel operation*:

It is vital to develop and put into practice efficient systems for fleet management, and individual vessel operation and maintenance that will ensure the optimum use of energy.

To date efforts in energy optimisation in fishing have mostly concentrated on technical and operational problems. People more attuned to energy policy and resource management have often not been involved. One of the goals of energy optimisation is thus for technical and operational experts to involve other people concerned with energy policy and resource management. Only with their involvement can efforts towards energy optimisation be truly effective.

2.4 Specific Problems and Opportunities to Consider

2.4.1 International Cooperation

One of the recurring themes in discussion at the Working Group meeting was the need to improve cooperation between people in different countries. Many individuals and institutions around the world (by no means all of them were represented at the Vancouver meeting) are working on energy optimisation problems. Clearly that overall effort could be made more effective if there was better sharing of information between different individuals and groups. Referring to the plan described in 2.2, problems are known and opportunities for dealing with them exist or are being identified, but the lack of cooperation slows down the iterative process of devising an effective strategy for dealing with them. Specific opportunities for cooperation include:

- Basic sharing of information about what projects different people are working on.
- Sharing of technical information about such projects and their progress.
- Actual collaboration on specific projects.
- Use, or better use, of under-used research facilities in different countries.
- Identification of opportunities for energy saving and barriers/bottlenecks in the way of putting opportunities into practice.
- Involvement of individuals and organisations who have so far not participated in the Working Group's efforts, particularly from the fields of energy policy and resource management.
- Ways of testing, verifying, and convincing fishermen of the benefits of new designs, equipment and devices.

Specific areas where the Working Group considered improved international cooperation was particularly desirable included:

- Opportunities for the design and use of multi-hulled vessels.
- Methods of vessel and gear design, including use of computer aided design (CAD) systems, tank modelling, and fishing simulations.

Cooperation cannot be achieved overnight. However, the Working Group considered there was no barrier to *begin* to translate the "wish list" into reality.

A first step would be to establish an international database specifically relating to energy optimisation in fisheries. The FAO representative at the Working Group meeting

suggested that this might be done at FAO. There is already a database at FAO under the Clearing House for Fisheries Advisory Services and this could easily accommodate references to energy optimization in fisheries. These could include lists of institutes working specifically on fisheries related issues.

A second suggestion was to publish a newsletter. One problem with the literature is that much of it is written in languages other than English which makes it difficult to share widely. One way at least to start overcoming this problem, as well as keeping people up to date on developments in the field, would be for a newsletter to be published regularly, perhaps by the IFEO Working Group secretariat. This could contain abstracts in English of relevant papers, as well as less formal news of ideas, proposals, and developments.

Longer Term Strategy

Over the longer term, a holistic, inter-disciplinary systems approach to energy optimisation in fishing should exist. It could be made to exist by establishing an international forum which would facilitate:

- Consultations on energy policy.
- Cooperation in identifying basics to the efficient use of energy.
- Cooperation on identification of opportunities for optimum energy use.

2.4.2 Influencing Energy Policy Makers and Resource Managers

People dealing with energy policy as well as those concerned with technical issues must be involved in the energy optimisation issue. The goal of this is:

- To clarify energy related threats, challenges, and opportunities to those concerned with energy and fisheries management, as well as fishermen themselves.
- To identify policy based methods of minimizing threats, coping with challenges, and making best use of opportunities.
- To communicate this information to other energy and fisheries related policy makers at all levels.
- To help coordinate research and development.
- To help exchange of information, personnel, and use of research facilities.

The Working Group is the beginning of a forum where policy makers and resource managers can become involved.

2.4.3 Most Effective Use of Modern Technology

Computer technology is a powerful tool for assisting with energy optimisation. It can be used at the level of design of individual aspects of gear or vessel form, as a tool to assist vessel operations. In due course it will be used to help plan and predict progress in complete fishing enterprises, from vessel design and construction, to operation and fleet management. The fishing industry should harness this power effectively. Possible steps include:

- Establishing an interlinked system of databases for energy related information about hydrodynamics, propulsion, equipment, materials, construction methods, operation and management systems, maintenance systems, and vessel and gear design.
- Developing "expert systems" to assist with the design and procurement of energy efficient vessels and equipment.
- International cooperation in developing and using computer aided design (CAD), artificial intelligence, advanced modelling, operations research, and simulation systems.

2.4.4 Spreading the Word

There is a tremendous lack of awareness in the fishing industry, and even amongst vessel designers and builders, of the opportunities for energy optimisation. It is vital to collect and disseminate information and knowledge about the subject through seminars, publications, or whatever means are most suited to the intended audience. Information should deal with:

- Resistance and seakeeping properties for industrial and artisinal vessels with both conventional and unconventional hull forms.
- Devices and practical, operational, ways of improving energy consumption on both new and existing vessels.
- Properties of propulsion systems, equipment and components, as well as devices for improving propulsive efficiency.
- Ways of designing and building new vessels, and retrofitting old ones, with energy efficient systems.

2.4.5 Monitoring and Evaluating New Technology

New technology is constantly being introduced in the fishing industry. The Working Group recognised a need to evaluate new technology from the point of view of energy optimisation and to disseminate this information, in other words to have a kind of

"consumer guide" system for those who might invest in new technology. It would be necessary to establish systems for testing and evaluation as well as finding the best means of communicating results. Possibly energy optimisation might be assisted by the establishment of energy-related codes of practice/standards for new equipment.

2.4.6 An International Advisory Service

An international service to advise fishery administrations and the fishing industry worldwide on energy usage and implications for energy of policies and regulations is desirable. Clearly, however, the IFEO Working Group, or whatever succeeds it, needs to be better established institutionally before it could undertake or sponsor such a role.

3.0 HARVESTING

Improvements in energy efficiency by developments in harvesting technology have been varied and significant. Development work takes place in many countries with support from funding agencies both for the purpose of promoting energy efficiency and for other reasons more related to general fisheries development.

Papers presented to the Working Group described current research and development in several aspects of harvesting related technologies. These included:

- Developments in pelagic trawl construction and operation, where energy savings can result from improved mesh design, uniform distribution of strain, and modification of trawl mouth opening.
- The use of "supermesh" trawls, particularly with new high tensile materials.
- Vessel and gear monitoring systems, based on computer technology.
- The use of electronic charts.
- Ways of modelling dynamics of fishing gear with computers.
- The use of a self hauling rope reel in Scottish seining.

These of course are only some of the energy related developments in harvesting technology. Discussion at the working sessions, plenary sessions and drafting panels suggested several other possible opportunities for development in harvesting related technology which could benefit the energy efficiency of harvesting systems. Ideas include:

- further improvement in net design, including the use of CAD systems;
- further improvement in gear monitoring and control;
- further improvement in navigation (using electronic charts and satellite driven global positioning systems;
- better understanding of fish behaviour to predict where and how it is best to fish;
- developments in exploitation of underutilized species;
- the use of remote and manned underwater vehicles to study gear behaviour in the water;
- environmental impacts resulting from changes such as reduced emissions;

- the establishment of an energy conscious system for selection of harvesting methodology;
- the drawbacks and benefits of pair trawling;
- the recognition of systems as a whole on small vessels;
- recognition of the potential benefits of the use of integrated bridge electronics, and ultimately their widespread adoption;
- by catch elimination/catch selectivity/species identification;
- investigation of the potential savings to result from resource mapping, fish forecasting and the resulting increased efficiency during harvesting from improved navigation;
- materials design (nets, gear, twine, etc.);
- fish detection system improvements;
- the development of systems for by catch separation in the net;
- fish attraction systems (acoustic, electric, gear and light, food and sexual);
- vessel noise optimization;
- safety; and
- data base building and use for education, research etc.

All of the above hold potential for positive impact on the energy efficiency of current or future harvesting systems, and should be considered for research and development activities. Harvesting techniques should continuously be improved in terms of efficiency (in many cases with potential savings in energy) to ensure long-term profitability. Care should be taken, however, to take additional measures in order to avoid extensive growth in fishing effort for fish stocks that do not seem to allow such a development. Savings of energy will not, of course, result unless fishermen learn about these opportunities and have the means to put them into practice. The unique issues concerning the transfer of technology in this industry are dealt with in a separate chapter.

4.0 VESSELS

Energy efficiency considerations in vessel design depend very much upon vessel size, harvesting technique, and the type of fishery in which they are employed. For example, considerations are likely to be very different between a large factor freezer trawler and a smaller vessel used in an artisenal type fishing in a developing country. On the other hand, some basic techniques of saving energy may be applicable to both, depending on circumstances.

Papers presented to the Working Group relating to vessel design discussed:

- The advantages of using wing type rather than piped beavertails on seine vessels.
- Addition of a bulbous bow to a fishing vessel and how a conventional bulb compared with side bulbs.
- The advantages of propeller ducting and appropriate engine speed.
- The effects of using a bulbous bow on added resistance and on heave and pitch in a seaway.
- Hullform investigation in Norway.
- Noise optimisation by improved propeller design.
- Opportunities for energy saving by improvements in propeller design.
- How vessels respond to pack ice conditions and necessary propulsion considerations.
- Opportunities for reducing pitch and reducing fuel use by a water retention tank in a vessel's forepeak.
- Opportunities for energy savings and improved vessel versatility by using a small waterplane area twin hull (SWATH) design.

Some of these innovations have proven themselves to be advancements when used in the right application and others are as yet untried. The impact of the application of appropriate changes and improvements in a large percentage of the correct circumstances would be great and be of benefit to the fishermen specifically and the world at large. There have however been difficulties encountered in the adoption of these and other innovations but this issue is dealt with separately under the chapter entitled Technology Transfer. Nonetheless discussion at the meeting highlighted the fact that there is logic for continuation of research and development in areas such as but not limited to the following:

- further investigation of the impacts of superior beavertail design and construction;
- the design of hullforms specific to vessel utilization and location;
- the energy consumption reductions and speed increases resulting from the suitable application of bulbous bows;
- design in general according to operational profile;
- development of energy efficiency regulations to be incorporated into a standard building code for vessel design;
- creation and maintenance of a quality data base (to include data on resistance, seakeeping, costs, operational issues, propulsion system performance, machinery room layouts, vessel-gear relationships, noise etc.) to be used during the design stage for new vessels;
- the suitability of materials under varying conditions;
- how to reduce the running resistance of existing vessels;
- adoption of a systems approach to the design of small and intermediate vessels;
- how to ensure proper maintenance is practiced;
- how to ensure removal and/or rehabilitation of old vessels that are not as energy efficient as newer ones;
- how to avoid overpowering vessels, in the face of government assistance programs that allow this or provide incentive for this to happen, and how to ensure selection of optimum engine size;
- how to test and verify benefits from new designs, equipment, devices and software and then disseminate information of the merits of innovations;

Special consideration is warranted for artisenal fisheries. The size and method of utilization of the vessels is sufficiently different from larger nearshore and offshore vessels that some of what has been identified above does not apply. Further, a large percentage of the world's fisheries are artisenal, and exist in the developing nations where the implementation of improvements will have the greatest impact on the status of welfare of the beneficiaries. Here, design changes such as the following require investigation:

- cost and energy consumption reductions from the use of diesel versus gasoline outboard engines;

- use of diesel engines and hull forms that allow their use;
- catamaran style design of artisenal fisheries vessels;
- the possible benefits of the use of nozzles on outboard engines;
- increased safety factors in the design of vessels;
- anti-fouling paints that can reduce vessel resistance;
- increased use of sail power when and where appropriate;
- adoption of a fleet fishing system to include mother ships; and
- improvements in the maintenance practices of propulsion systems.

There are a number of socio-economic considerations that must be made, such as the impact of improvements that will reduce employment - an undesirable activity in almost any developing nation. There may be sound logic for governmental departments other than those concerned with fisheries to support a program to change the construction materials used for vessels, as would be the case in any country where wood or trees are in short supply. This would offer benefits in more than one area. There is much yet to be done but with appropriate direction from organizations such as FAO which is already very active, and the IFEO which hopefully will soon be more active some of these problems will be overcome.

5.0 TECHNOLOGY TRANSFER

To improve the efficiency of fishing systems is unquestionably desirable if it can be accomplished in a manner that does not (apparently or actually) adversely affect other issues important to the industry. There are several stages to accomplishment of technology transfer -- the process of first identifying the most appropriate method for disseminating information, secondly achieving acceptance of the information by the recipient (the fishermen) and lastly inspiring action as suggested requires success in all three phases in order to truly achieve technology transfer. There are unique circumstances to be recognized in the designs of the educational systems needed to accomplish true technology transfer in the fishing industry. For example, many of the world's fishermen are uneducated, parochial and often interested only in issues which affect short term profits. Much of the technology dealing with energy efficiency in the fishing industry requires capital investment or less than obvious immediate payback. There is also nothing worse than transferred technology which fails in demonstration and therefore gains a poor reputation and resistance to adoption in fishing communities. Great care and tact is required in this field.

Papers were presented addressing the following issues:

- the Newfoundland ENERSEA program which has been highly successful in teaching primarily inshore fishermen about the benefits of utilization of propellers suitable for the vessel, and the reductions of energy consumption from running at the right engine speed, primarily through seminars and on-site demonstrations;

- the reductions in energy consumption that result from the use of Scottish seining methodology rather than trawling;

- the increased pull and reduced energy consumption that result from the fitting of propeller nozzles, slotted blade propellers, and slotted nozzles, and problems associated with demonstration of the findings;

- various methods found to be successful in transferring technology to Newfoundland fisherman by the Marine Institute - seminars at the Institute, seminars in local communities, and use of distance (television) education systems; and

- an introduction to and description of the successful use of a mobile training classroom for transferring technology to fishermen in Alaska

Discussions at the Working Group identified a number of suitable media for accomplishing technology transfer:

- production and distribution of a simple manual on fuel saving in fisheries;
- the production and then distribution of video films;

- attendance at trade show booths and presentations;
- formal schooling:
  - elementary,
  - secondary,
  - post secondary,
  - continuing education (seminars, distance learning etc);
- publication and distribution of technical reports to all those that might possibly benefit;
- action by fishermen's unions such as sponsorship of education;
- articles in trade publications relating to issues of importance;
- suppliers and manufacturers taking a greater interest in issues relating to energy conservation and publicising such in their product literature and sales efforts;
- personal contact and experience (friends, family, etc.); and
- demonstrations (facility based and industry based).

Identification of the most suitable method for use under any particular application is an extremely important task which may often be best left to appropriately trained individuals such as marketing specialists and/or education experts.

Implementation of the above can be accomplished through any of a number of means:

- international cooperation - agencies such as FAO;
- translation and publication of papers and other findings;
- government - private sector cooperation/cost sharing on projects that will provide education;
- industry participation in R & D and training activities, particularly by manufacturers;
- associating the education or technology transfer with an item or issue known to be of interest to the fishermen, such as associating reduced energy costs with new vessel purchase; and
- establishment of a single authority for guidance.

There are of course a number of barriers to both the implementation and the success of technology transfer:

- different languages and cultures;
- funding;
- access to interested recipients;
- parochial attitudes and lifestyles;
- cost;

- bad prior experiences or exposure;
- cost effectiveness;
- priority of energy efficiency in comparison to other issues;
- lack of acceptance of energy efficiency initiatives by others in the fishing industry; and
- the present level of technical knowledge of the fishermen.

6.0 THE FUTURE OF THE IFEO WORKING GROUP

The Working Group's final, but most important, task, was to decide how to put what it had discussed into practice.

- How should the Group itself be structured?
- What topics should it deal with?
- How should it deal with them?
- Where can the Group obtain support?
- How should the Group operate in the short term, while its long term future is being determined?

6.1 Group Structure

The IFEO Working Group is recognized by the Government of Canada and the Food and Agriculture Organization of the United Nations (FAO). This first meeting of the Working Group, Vancouver, Canada, 28-30 August 1989, consists of individuals, some on their own account, and other representing institutions or governments or international organizations. The report of the Working Group is to be presented to the Government of Canada, FAO and to the members for appropriate action. With reference to the future, the members considered it inappropriate to attempt to formalize the Working Group as an intergovernmental organization. First, this would lead to a lack of individual independence and initiative. Second, establishing the group and becoming recognised as an intergovernmental organisation would in practice be difficult. On the other hand, the group could not continue to function effectively on its own. It might be able to discuss, but implementation work would likely be very limited, particularly in developing countries.

The FAO representative at the meeting proposed a simple and practical approach which delegates accepted without dissent.

FAO has an energy program and, as was pointed out several times during the Working Group meeting, is working on several fronts on energy conservation in the fishing industry in developing countries. On the other hand, FAO lacks resources (both financial and in available personnel) to carry out their basic program effectively (though funding does exist for specific local and regional programs supported by cooperating donor agencies).

The FAO representative suggested that the IFEO Working Group could provide the participants for an FAO Expert Consultation. This would mean:

- Such an Expert Consultation would provide a report for submission to the FAO Committee on Fisheries; the work of the Expert Consultation would

also be reported to the FAO Interdepartmental Working Group on Environment and Energy.

- The participants would retain an individual rather than institutional or government status.

- Their recommendations would be "plugged in" to an existing, worldwide, institutional mechanism (i.e. FAO) which would ensure recommendations reached member governments, including fisheries, energy, agriculture and donor agencies.

- Such a structure would increase the likelihood of national governments providing specific funding to or via FAO for projects related to energy efficiency. (It might, or might not, turn out possible as well to provide FAO with funds to augment its basic program in energy optimisation in fisheries.) National governments could be persuaded to assist by suggestions both from FAO and IFEO Working Group members, and there would be no conflict between such requests.

Country Programs

At a different level, there is the issue of how to most effectively put programs into practice in developing countries. A common theme reported by delegates was difficulty dealing with local fisheries bureaucracies. Wherever possible contact should be made as directly as possible with fishermen themselves or local fishing organisations. National aid agencies and international organisations may find this difficult to do, and it was suggested that where possible problems of official protocol might be avoided by implementing programs through non-governmental organizations.

6.2 Topics for the Group

There are many considerations to energy optimisation in fishing, and each of them can be tackled from different angles. The main considerations identified were:

- *Commercial* - whether an energy saving technique makes best sense to the individual fishing operation, considering all other factors.

- *National economic* - the role of energy saving in national economic policy, for example where foreign currency to purchase fuel is scarce.

- *Environmental* - the environmental effects of energy consumption, including contribution to global pollution problems.

- *Resource management* - how apparently sound ways of saving energy or improving vessel or gear efficiency may in fact lead to the same energy consumption with greater impact on scarce fish stocks.

These considerations may be addressed in different ways, including:

- Technical studies and research, into both ways of improving energy efficiency, the effects of doing so, and the possible consequences of not doing so.
- Changes in operational practices.
- Formulation and statement of national policy strategy on the issue all achievable or made more effective by
  - legal/regulatory approaches
  - publicity
  - education
  - financial assistance, including tax incentives, access to credit, seed monies, and subsidies.

A matrix showing the possible interplay of these several factors is shown in Fig. 6.1.

FIG. 6.1

	Technical Studies, Research	Operational Changes	Legal, Regulatory	Policy Strategy	Financial Incentives	Publicity	Education
Commercial	X	X					
National Economic	X	X	X	X	X	X	X
Environmental	X		X?	X	?	X	X
Resource Management	X		X	?			X

The tasks are large and complex and clearly beyond the scope of the Working Group as presently conceived or ever likely to be structured. Delegates considered the appropriate role for the Working Group was to promote and further the activities suggested above by:

- Sponsoring and stimulating collection and exchange of information.
- Reviewing, monitoring, and supporting research and development.
- Proposing ways and means of promoting energy optimisation, including improvements to existing systems and solutions to current problems.
- Promoting training and education.

In sum, the Group should have the role of adviser and catalyst for these activities, rather than direct sponsor.

6.3 Support for the Working Group

Delegates were very conscious of the practical need for financial support for the Working Group. The Vancouver meeting had been very largely sponsored financially by the Government of Canada (Department of Fisheries and Oceans). The amount of money required to keep the group "ticking over" before its future is decided is likely not great. However, funds are needed for substantive work (whether conducted through FAO or not).

Provided the Working Group aims and status are clarified, it was felt there should be further funding available through government departments, manufacturers, and major aid and international credit agencies.

6.4 Short Term Operation

Whatever the long term future, the Working Group requires cohesion through some intermediate point of reference -- an address, telephone, and contact person -- which will enable future planning. Arrangements were made as follows:

(a) The Working Group should continue to be based

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(b) A Steering Committee would form to guide the Group's future. The following delegates agreed to serve on the Steering Committee:

Prof. A. Fridman	USSR
J. Fitzpatrick	FAO, Rome
D. Lodge	USA
R. van Marlen	Netherlands
Prof. Hameed	India
A. Duthie	Canada
Prof. A. Endals	Norway

The Steering Committee was invited to meet in Cochin, India, in 1990. In the meantime, the opportunity for affiliation with FAO would be fully investigated. The provisional agenda for the April/May 1990 meeting would be --

(a) Consideration of this report.

(b) Interest of other countries and/or institutions in joining the Working Group.

(c) The mechanism of linking with FAO and drafting of an agenda for an Expert Consultation on Energy Optimization in Fisheries.

(d) Opportunities for future financial support for the Working Group itself and for programs it may initiate.

(e) When and where the next meeting of the Working Group should be. The USSR or Norway are the most likely possibilities.

(f) Consideration of further comments from Working Group delegates on the proposed link with FAO or other matters following reporting on the meeting in their home countries.

ANNEX A

LIST OF PARTICIPANTS

APPENDIX TO WORKING GROUP PROGRAMME

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